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Dollarization of Debt Contracts: Evidence From Chilean Firms

Miguel Fuentes*

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This paper uses a new data set to estimate the causes and consequences of foreign currency debt in firms' balance sheet. The evidence from this sample of Chilean firms indicates that dollar-denominated debt is more used by larger firms and those more exposed to foreign competition. We find evidence that dollar denominated debt combines with exchange rate movements to produce a negative balance-sheet effect that reduces firm's investment in periods of strong exchange rate depreciation. This negative balance-sheet effect is associated with long term debt and appears to be non-linear in the amount of real exchange rate depreciation.

JEL Codes: F31, F49

Keywords: Balance Sheet Effects, Currency Mismatches, Dollarization, Macroeconomics of Developing Countries.

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1 Introduction and Motivation

The presence of dollarized debt in firms' balance sheets and the implications it might have for the functioning of the economy emerged as central topics in the research agenda of international economists after the Asian financial crises observed in the late 1990s. The significant devaluation of many Asian countries' currencies and the severe contraction in economic activity that followed were attributed in part to the existence of dollar debt on the balance sheets of many corporations. Krugman (1999) was one of the first to identify this balance-sheet channel as the mechanism through which the depreciation of the nominal exchange rate could have devastating effects on the aggregate level of economic activity.

The preceding analysis leads naturally to the following two questions:

1. Why do firms in emerging markets contract debt whose payments are denominated in dollars?
2. How does the presence of dollar-debt influence the effect that exchange rate fluctuations have on firms' investment?

These are the two problems that we will investigate in this paper. Both are important questions whose resolution is still a pending issue in the International Finance literature. Our goal is to contribute to this literature from an empirical viewpoint. For this we will use a new database of Chilean firms that is extremely well suited to analyze the dollarization phenomenon.

The use of the U.S. dollar in financial contracts in developing countries is a phenomenon that has been analyzed before in both the Development and International Macroeconomics literatures. The first example of this is the currency substitution literature that studies why the U.S. dollar displaces the domestic currency as medium of exchange, unit of account and store of value in (usually) high-inflation countries. In a more recent development, various researchers have pointed

out to the existence of an *original sin* that prevents emerging markets from issuing in international capital markets debt that is payable in the country's own currency.[1] The *original sin* literature has focused mainly on the dollarization of official (i.e. government) debt.

In contrast, in this work we will shift the focus of attention to the use of the U.S. dollar in debt contracts by firms operating in an emerging economy. Due to limitations on the availability of adequate data, research on this area is relatively novel and there is no clear empirical consensus on the significance of balance-sheet effects. In this paper we will use a unique data set that contains detailed financial information for a sample of Chilean firms. There are several reasons that make this topic one that deserves further attention, and various characteristics of the Chilean economy that make it an interesting case to study.

In first place, it will permit us to know more about corporate finance decisions in emerging economies. This will enhance our understanding of how firms' financing structure responds to changes in domestic and foreign currency-denominated interest rates, exchange rate fluctuations and changes in the exchange rate regime.

A second reason that makes this an important topic and the country to be studied a relevant one, is that it will teach us what happens to the financial structure of firms when a country liberalizes its capital account. As documented by several authors, Chile opened its capital account - especially to inflows- during the 1990s and it would be interesting to examine how this phenomenon affected the currency composition of firms' liabilities. This is especially important to extract policy lessons for economies that attempt to liberalize their capital accounts. In this sense, this paper will contribute to improve our understanding of how the structure of the international financial system will evolve as emerging economies continue to open themselves to foreign capital flows.

The Chilean case is also interesting since in the period under study there were no major

[1] Eichengreen and Hausmann (1999) were the first to introduce the term "original sin" into the economics literature.

economic crises and the exchange rate regime cannot be characterized as fixed[2]. This feature adds to the interest of the study since, as will be described, most other studies that have previously addressed these issues, have dealt with countries involved in severe economic downturns, frequently caused by the collapse of fixed exchange regimes. Chile's experience will shed some light on the effects of exchange rate fluctuations during more tranquil periods.

Apart from helping us to understand the financial structure of firms in emerging markets, this paper will study eventual pathologies that the dollarization of firms' financial structure might cause. As discussed earlier, we are especially interested in knowing if dollar-denominated debt influences the way in which exchange rate movements affect the firm. The key mechanism that we are interested in examining is if the additional payments -measured in domestic currency- associated with dollarized debt that the firm needs to make when the exchange rate depreciates affect the firm's creditworthiness and investment. This is what has been called the balance-sheet channel through which exchange rates could exert a powerful effect on the economy.

The existence of this channel is based on the firmly established fact that firms' investment depends positively on the amount of internal funds it has available[3]. However, the depreciation of the nominal exchange rate can also be beneficial for the firm's investment. As is well know, the income of several firms is positively tied to exchange rate fluctuations. This is the case of firms producing in the tradable sectors of the economy. Therefore it is also possible that exchange rate movements improve the value of capital allocated to the tradable sector, with a consequent boost to investment. Then, when analyzing the balance-sheet mechanism it is central to consider the degree of currency mismatch between the firm's financial structure and flow of income.

[2] At the beginning of the period of study (1991-2001) the exchange rate regime consisted of target zone that was subject to various alterations in subsequent years. In 1999 the Central Bank of Chile withdrew its commitment to defend the exchange rate bands moving towards a more pure float.

[3] The literature that analyzes the financial market imperfections investment has a long tradition in macroeconomics. Fazzari, Hubbard, Petersen, Blinder and Poterba (1988) compare the empirical performances of q-based models with the ones that incorporate financial imperfections and report that the latter have strong empirical support. More recently Hall, Mairesse and Mulkay (2000) survey several studies of firm-level investment and conclude that internal cash flow has a clear and robust effect on firm's investment.

The possibility that dollar debt and its associated currency mismatch could be harmful for the economy has important implications for the design of economic policy. Eichengreen, Hausmann and Panizza (2003) document and study the negative consequences that foreign currency denominated debt has for the functioning of the economy. These authors use country-level data and conclude that higher levels of currency mismatch in a country's debt are associated with (i) lower credit ratings and hence more expensive financing, (ii) higher fear of floating as defined by Calvo and Reinhart (2002) and, (iii) higher output volatility. On related work, Céspedes (2005) and Calvo, Izquierdo and Mejía (2004) also document using macroeconomic data the threat to macroeconomic stability posed by foreign currency denominated debt. This paper will contribute to this literature by providing microeconomic evidence to serve as complement to the macroeconomic approach used by these papers.

This rest of the paper is organized as follows. In the next section we present a brief review of the previous literature on dollar-denominated debt. Section 3 describes a new data set that will be used to analyze our research questions. The empirical strategy with which we study these phenomena is presented in Section 4. The next section presents the results we have obtained. Section 6 summarizes the main conclusions and policy lessons and suggests further areas of research.

2 Literature Review

The issue of dollarization of financial contracts has been widely studied in the International Finance and International Macroeconomics literature, specially the one that focuses on developing countries. A major branch of the literature tries to explain the degree of dollarization of the financial and banking systems and why it varies across countries and time. These literature is well summarized by the work of Ize and Levi-Yeyati (2003), De Nicolo, Honohan and Ize (2003) and Levy-Yeyati (2006). Those papers use macroeconomic data to evaluate both the causes and consequences of currency substitution for developing economies. That work sparkled in part the recent interest on

the microeconomic aspects of firm dollarization. Since this paper deals with dollarization at the firm level, we will focus on a revision of the literature that concentrates on microeconomics aspects of currency mismatches. In particular we will discuss first previous work that has aimed to explain the determinants of firms' currency composition of debt and continue next with the papers that have tried to identify a balance-sheet effect at the firm level in the aftermath of exchange rate depreciation.

Several authors have tried to explain from a theoretical perspective firms' motivations to contract debt that promises payment in dollars. Since a comprehensive review of the literature is beyond the scope of this work, we will mention the most representative papers that illustrate well the main approaches taken by researchers in the field.

In first place, Jeanne (2000) attributes the presence of dollarized debt in firms' balance-sheet to the combination of a fixed exchange rate regime and an implicit guarantee that the government will assist firms that become insolvent if devaluation occurs. This type of explanation is inspired by the experience of many developing countries and stresses the role of misplaced incentives as the cause of debt dollarization. In a related paper, Jeanne (2005) builds a theoretical model that identifies the lack of credibility of a country's monetary policy as one of the main elements to explain foreign currency denominated debt. As can be seen, this line of research stresses the role of (inadequate) domestic institutions in the emergence of dollar-denominated debt.

Along these same lines, Tirole (2002) views dollar debt as the mechanism used by the private sector to induce the government to keep its compromise with the pegged exchange rate. Dollarized liabilities emerge then in the equilibrium of the political economy game played between domestic entrepreneurs and the government. Although Tirole's model has strong theoretical foundations it is hard to derive from it any simple empirical predictions on the determinants and effects of dollar-denominated debt.

Next, Caballero and Krishnamurthy (2003) explain dollar debt as a consequence of the underdevelopment of financial markets in emerging economies. An interesting implication of this work is that the scope of dollarization should decline as domestic financial markets become more sophisticated. This financial-underdevelopment argument can be complemented with the insights provided by the corporate finance literature as exemplified by Froot, Scharfstein and Stein (1993). In the work of those authors currency mismatches in firms debt portfolios is the optimal decision of a firm manager seeking to hedge the currency risk inherent to the firm´s business as would be the case of multinational firm operating in several countries. In the empirical analysis we will used elements derived from both lines of work to study the determinants of firm-level dollarization.

Although all these papers provide interesting insights about the dollarization of financial contracts, they are subject to some critiques. In first place, a crisis scenario following the collapse of fixed exchange rate regimes inspires both Jeanne (2000) and Tirole (2002)'s work, so their validity for explaining the forces that lead to dollarization in a floating exchange rate regime is not clear. Secondly, the majority of the models reviewed here predict a corner solution where all of the firm's debt is predicted to be payable in dollars. As we will show in section5, this is a feature soundly rejected by the data used in this paper and by the evidence presented by other authors who have worked on this topic.

The empirical study of the determinants firms' debts dollarization has been an active area of research in recent years. This has been the result of the availability of databases containing firm level data for several countries. An excellent example of the empirical literature appears in the December 2003 issue of the journal *Emerging Markets Review* that discusses the cases of several Latin American economies. Along with this the papers by Bleakley and Cowan (2002), Gelos (2003), Cowan, Hansen and Herrera (2006) and Luengnaruemitchai (2003) have also addressed the factors that influence the fraction of debt that firms and have studied empirically what factors determine the fraction of dollarized debt in firms' financial structure. The general conclusion that can be

drawn from those studies is that more outward oriented firms -those that export a higher fraction of their output or operate in the tradable sector of the economy- are the ones that exhibit higher liability dollarization. [4] Along with this, liability dollarization tends to increase with firms' size and leverage level. Although the body of evidence for developed economies is smaller, the evidence in the paper by Kedia and Mozumdar (2003), which analyzes the currency choice composition of bonds issued by U.S. corporations, is consistent with the findings reported for developing countries.

The work on the *effects* of currency mismatches in firms' liabilities has also focused overwhelmingly on developing countries. The main interest has been to study how the combination of dollar-denominated debt and exchange rate depreciation affects firms' investment. Before reviewing what has been previously done in this area, we will explain the mechanism through which dollar debt can harm the firms' investment when the domestic currency depreciates. As Krugman (1999) initially pointed out, when the exchange rate depreciates the firm will need to increase the amount of financial resources, measured in pesos, that it needs to meet its debt obligations.[5] Since the dependence of a firm's investment on its own cash flow is a fact firmly established in previous research, the larger payments associated to dollarized liabilities after the currency depreciates can negatively affect the firm's capacity to obtain financing and thus to undertake new investment projects.

This channel is the basis for the identification strategy used in several papers that have studied the existence of a balance-sheet effect. As summarized by Cowan et al. (2006) the evidence available until now for different countries and periods remains mixed: the balance-sheet effect is found to be negative in some studies, positive in others and non-existent in the remainder.[6] Since a full review of the empirical literature is beyond the scope of this paper, we will concentrate the discussion on the papers that have studied this issue for the case of Chile which is the country analyzed in this

[4] The only major exception to this according to Galindo, Panizza and Schiantarelli (2003) are the cases of Argentina and Brazil where there is not a strong statistical relation between the degree of outward orientation and the extent of liability dollarization.

[5] In this context peso refers to the domestic currency.

[6] See Table 1 in the working paper version of that paper (Cowan, Hansen and Herrera (2005)) for a summary of the main findings of previous empirical work on the existence of balance-sheet effects.

paper.

The Chilean case has been previously analyzed in Bleakley and Cowan (2002), Benavente, Johnson and Morandé (2003) and Cowan et al. (2006). The first two of these find that balance-sheet effect is positive while the last one reports a negative effect after controlling for the effects of RER depreciation on firms' profits and their use of financial (e.g. foreign currency) derivatives. In this paper we will explore one further aspect of how the currency mismatch financial contracts might interact with RER depreciation and affect firms: the term structure of debt contracts. In particular we will distinguish among short term and long term debt. This aspect has not been analyzed for the case of Chile. Aguiar (2005) is, up to our knowledge, the only other study that has analyzed if the balance-sheet effect differs for long and short term debt. That paper analyzes the case of Mexico and finds that the balance-sheet effect is associated exclusively with short term debt. Although Aguiar (2005) is an important contribution, it is based on the Tequila crises episode of 1994. Since that event was a major disruption to the Mexican economy, the results reported in that paper might be difficult to extrapolate to non-crises situations. The study of the Chilean case of our paper will therefore complement the study of Aguiar (2005) and could help us understand how RER changes interact with the financial structure of firms in more quiet times. This might be an important channel to gauge how RER movements affect the economy.

3 Data

The data set we use to study the dollarization of financial contracts will allow us to enrich the work done in some previous studies. The three main advantages of the data set are (i) it includes a broader group of firms than the one used in previous studies, (ii) it covers a more extended period of time and (iii) it has information on short and long term debt. A possible drawback of our sample is that it contains information for only Chilean firms. This may cast some doubt on how valid the conclusions of our research are as policy guides for other economies. Nevertheless, the Chilean

experience has some interesting features as is discussed below from which policy lessons for other developing economies could be drawn.

The source of the data is the national agency in charge of supervising Chile's securities market. That agency is called *Superintendencia de Valores y Seguros* (SVS) and is under the Ministry of Finance. Under the laws that exist in Chile, all companies that organize themselves under a specific legal structure must submit their financial information to the SVS. In practice this means that all publicly listed companies must comply with this requirement. Nevertheless, non-listed companies as well as some state-owned firms also comply with the requirement of making their accounting data available to the SVS. Another important feature of this data is that it contains non-consolidated balance-sheet information. In practice this means that we will use data of individual corporations and not from business conglomerates. This is a desirable feature of the data since it indicates more closely the economic incentives of each manager. Also, conglomerates can include firms operating in a wide variety of economic sectors. As will be explained below, it is very important for the purposes of this study to characterize carefully the exact nature of the firm's activity which makes conglomerate data less attractive.

Our sample has firm-level observations for the period 1991 to 2001 while Bleakley and Cowan (2002) have observations for the period 1991-1999, Cowan et al. (2005) for the period 1995-2003 and Benavente et al. (2003) for 1994-2001. Although the samples therefore overlap for a significant period, the one used in this paper has potentially very valuable information and advantages in comparison to the other papers mentioned. As Figure1 shows, it is especially interesting to use observations after 1999, because currency depreciation was significantly faster in that period. Indeed, as mentioned earlier, in 1999 the Central Bank formally abandoned the exchange rate target zone regime and moved towards a free float. Therefore, it is still an unresolved issue to examine if dollar-debt doesn't constitute an obstacle for investment even in a scenario of more severe depreciation. On the other hand, the additional sample period considered in this paper is one in which aggregate

growth and investment exhibited a significant deceleration in stark contrast to the fast rhythm of economic activity observed during the 1990s. On the other hand, the sample period used in this paper also includes the first years of the 1990s during which the nominal exchange rate depreciated significantly. Obviously this feature is shared by Bleakley and Cowan (2002) but not for the other studies that have analyzed the Chilean experience.

As mentioned earlier, one of the drawbacks of this data set is that it includes data only from Chilean firms. This differs with Bleakley and Cowan (2002) and Luengnaruemitchai (2003) who use data from a group of Latin American and Asian economies. Nevertheless, there are several reasons that make the study of the Chilean case interesting. First, it is difficult to get information about the currency composition firms' liabilities for an extended period of time for any country. Secondly, focusing on a single country guarantees that the financial information used is elaborated using the same accounting principles.[7] Finally, one can argue that since market economies react in similar manner when exposed to the same incentives, lessons from the Chilean experience can be valuable for policy makers and researchers more interested in other countries.

Another issue that makes the Chilean experience interesting to study is the widespread use of inflation-indexed contracts in the domestic financial markets. As the traditional literature on currency substitution and dollarization has pointed out, the demand for foreign currency and its use in developing countries is explained essentially by the low quality of the domestic currency. The inferior quality of the domestic currency is caused chiefly by the high rate of inflation observed in the country that depletes its value. In this high inflation scenario, the dollar appears as a credible and high-quality substitute for the national currency. An obvious alternative to the use of a foreign currency to avoid the costs of inflation is the introduction of inflation-adjusted units of account. Chile has used this mechanism for a long time and it will be interesting to analyze the dynamics of dollarization and balance-sheet effects in an economy that has experienced a widespread use of

[7] Up to our knowledge the only data source that tries to assemble firm-level financial data based on common accounting principles (Worldscope) does not include any information about the currency composition of liabilities.

inflation-indexed financial instruments which supposedly should limit the use of foreign currency.

Finally the data set assembled for this project distinguishes between short-term and long-term debt.[8] Indeed, the reporting requirements put in place by the SVS direct firms to report both the term and currency structure of their liabilities. We will use this information and, as is explained below, this feature of the data set turns out to be a particularly important one.

4 Estimation Strategy

The econometric strategy exploits the panel-data structure of the sample to analyze the two research questions of interest. The panel data approach will enable us to control for the unobservable elements that might influence the dollarization of financial contracts. Along with this, recent developments in panel-data econometrics allow a better modeling of investment that will help us to isolate more accurately the influence of dollar debt and nominal devaluation on investment.

The estimation strategy should recognize the fact that the amount of dollar debt contracted by the firm is the outcome of an optimization process. Moreover, the decision to dollarize debt might be influenced by the same factors that determine the amount of investment. This potential simultaneity problem will be one of the key concerns of the estimation strategy.

The first step is to study the determinants of the amount of dollar debt owed by each firm. For studying this we will also exploit the panel features of our data set to run regressions like (1):

$$\frac{D^{\$}_{i,t}}{SIZE_{i,t}} = \alpha + \lambda F_{i,t} + \theta S_{i,t} + \zeta_{i,t} \tag{1}$$

where $D^{\$}$ corresponds to the amount of dollar-denominated debt owed by firm i at the beginning of

[8] Specifically, short term corresponds to debt that must be paid in full during the next year. Long term debt is the remaining debt.

period t, $SIZE$ is measured by total assets, F captures firm's characteristics like size and financial structure while the exposure of the firm to foreign competition is measured by S. The influence of each of these variables on dollar denominated debt is given by the parameters' vectors α, λ, and θ while ζ is a well-behaved random error. The regressions will also include time and firm-level fix effects. Both debt measures in (1) are measured in 1999 pesos as will be the rule for all other financial variables used in the paper. Next we will explain the selection of each variable in the right hand side of equation (1) and how they were measured.

The use of foreign exposure measures (S) as a determinant of the degree of dollarization of a firm's liabilities can be justified from both theoretical and empirical grounds. From a theoretical perspective, a firm that maximizes its value from a mean-variance perspective has incentives to hedge its income and expense flows. This idea implies that a firm whose income is highly correlated with the exchange rate will have a higher fraction of debt denominated in dollars in order to match the currency of its income and expense flow. Therefore, one would expect that if higher values of S_i indicate a more significant foreign exposure of firm i, then the expected sign of the coefficient θ is positive. On the empirical front, past research in the area has demonstrated the importance of controlling for this type of variables when explaining liability dollarization.[9]

To control appropriately for this, one would need data on the amount of exports made by each firm and on the structure of the production process, specifically on the amount of imported inputs used by the firm. Unfortunately these data are not available at the firm level so we must use proxy variables to control for these effects.[10] The proxies measure the degree of import and export penetration in each sector of the economy and are inspired by Pacvnik (2002)'s work. They are constructed from National Accounts data and they consist in the ratio of exports and imports to total value added in each sector during each year. The Central Bank of Chile publishes this

[9] This is done, although with different proxy variables, by Bleakley and Cowan (2002) and Kedia and Mozumdar (2003) and several of the other papers discussed in Section 2

[10] In contrast to this paper, the data used by Gelos (2003) and Kedia and Mozumdar (2003) contain information on the amount of foreign sales made by each firm.

information for a much smaller number of sectors than there are in the ISIC classification which is the sectorial classification used in the firms' database. Therefore, it is the case that several ISIC codes have the same export/import penetration value.[11]

The specific financial features of a firm can exert an influence on the amount of its dollar debt through various mechanisms. Since dollar debt exposes the firm to exchange rate risk, it follows that those firms who are already more leveraged will be less willing to take the extra risk of foreign currency borrowing than a firm that has less total debt due. This implies that one should include the debt/capital ratio of each firm in regression (1). At the same time, one would expect that if foreign currency denominated financing is reserved for high-quality firms, the size of each firm (measured by total assets) has a positive impact on the degree of debt dollarization. This is also consistent with theories of corporate finance that predict that the financial structures of firm vary as they grow.[12]

Finally, the regressions include sector and year fixed effects. The year fixed effects will capture unobservable factors that might have affected the decision of how much dollar debt the firm will take. Of this, one of the most important is the relative cost of each type of financing which is given by the respective interest rates adjusted by the corresponding expected changes in the exchange rate. The time period through which our sample spans witnessed significant fluctuation in these rates and their differences. This can be clearly seen in Figure 2 which plots a UF-denominated interest rate and a dollar-denominated interest rate plus the observed (ex-post) exchange rate depreciation.[13] Even though exchange rate and other risks are omitted from these calculations, the path of both series suggests that the relative cost of both type of financing varied widely during the period. It is

[11] It was necessary to match the sector classification used in the national accounts with the ISIC standard. This was relatively simple since national accounts sectors follow closely the ISIC ones, although at a much higher level of aggregation.

[12] The argument is that smaller just-born firms don't have access to formal capital markets which they gain only as they become bigger and have more assets to pledge as collateral.

[13] The UF (*Unidad de Fomento*) is an inflation-indexed unit of account used in almost all financial contracts of more than one year in Chile. The Dollar-Equivalent rate in Figure 2 corresponds to the right hand side of an uncovered interest parity equation for real interest rates.

especially striking to compare the situation during the first half of the 1990s and the last two years of the sample.[14]

With respect to the second research question, the basic regression that we will use to estimate the effect of dollarized debt on firm's investment is:

$$\frac{INV_{i,t}}{K_{i,t-1}} = \omega(L)\frac{INV_{i,t-1}}{K_{i,t-2}} + \beta X_{it} + \delta DEP_t \frac{D^{\$}_{t-1}}{K_{it-1}} + \upsilon_{it} \tag{2}$$

Where INV measures the firms investment, K is the capital stock, X is a series of controls that affect investment, $D^{\$}$ is the amount of dollar-denominated debt, DEP is the depreciation of the real exchange rate and υ is a random error term. This interaction term is precisely the balance-sheet effect and hence δ is the coefficient of greatest interest in this paper. The indexes i and t stand for each individual firm and time, respectively. All stock variables are measured at the beginning of the period. The parameters to be estimated are denoted by β, δ and $\omega(L)$. The last of these is a polynomial in the lag-operator L, and it captures the need to control for the persistent nature of investment.

Equation (2) can be viewed as a particular form of the general panel data model:

$$Y_{it} = \beta X_{it} + \alpha_i + d_t + \varepsilon_{it} \tag{3}$$

Where α and d correspond to the individual and time effects respectively. The econometrics literature has developed a series of techniques to deal with the problems that complicate the consistent estimation of β. Of course, most of those problems originate in the presence of the unobservable individual effect α_i in equation (3). When the matrix X includes lagged values of the dependent

[14] It is worth to mention that during the first half of the 1990s Chile witnessed massive capital inflows attracted by the arbitrage opportunities suggested in Figure 2. That scenario was the one in which the Central Bank of Chile established the world famous (but now defunct) controls to capital inflows.

variable as in the case of investment equations, the traditional methods to deal with the individual effect create simultaneity among the right hand side variables and the error term. It is necessary then to use some type of instrumental variable (IV) technique.

Since a detailed survey of panel-data econometrics is beyond the scope of this paper, we will only mention here that we will use the Balestra-Nerlove IV methodology which instruments the lagged dependent variable with higher order lags.

The specification we will use to estimate the balance-sheet effect mechanism is based on the so call generalized accelerator model as described by Hall et al. (2000) and used in several other studies. In particular we will use the generalized accelerator model specification that uses the following as explanatory variables:

1. Lagged investment. The presence of this term can be justified by the presence of adjustment costs associated to increasing the capital stock.

2. Contemporary and lagged profits to capital ratio. This variable is used as a proxy of expected future profitability and other measures of the quality of the firms' project.

3. Contemporary and lagged sales to capital ratio. These are included to acknowledge the possibility that firms might not have access to perfect capital markets and hence the amount they can invest is determined in part by the amount of resources they can generate. It is also possible that current and past sales also constitute a proxy for the expected future profitability of the firm's projects.[15]

The inclusion of variables like the ones listed in # 3 recognizes that in reality capital markets have imperfections that make firms' financial characteristics influence the amount of investment that

[15]We did not include an empirical proxy of Tobin's q to control for firm's expected profitability as many studies do since not all the firms included in this paper are listed in stock exchanges and therefore there is not information about the market value of its capital stocks.

they can undertake. Given the stage of development of the Chilean economy, it is entirely reasonable to include these variables in the investment equation. The importance of cash flows for Chilean firms has been documented previously by Medina and Valdés (1998) and Gallego and Loayza (2001). Moreover, since the channel through which dollar debt and exchange rate fluctuations combine to reduce investment is precisely one related to the firm's financial health, it is crucial to include other controls like the ones listed in # 3 above. However, one should recall that we use data for firms that form part of conglomerates. This implies that in principle they have access to financing from other business units of the conglomerate. Hence, the eventual correlation of cash flow measures and investment is more likely to be explained by the fact that contemporaneous cash flow is a sign of expected future profitability instead of the main source of financing of the firm.

The preceding variables will be referred to as the "traditional" determinants of investment. In the regressions presented below, the balance-sheet terms are added as additional explanatory variables. This is a similar estimation strategy as the one used in other papers that have studied the balance-sheet effects. The use of a similar specification has the advantage also that it discards that any difference in the empirical findings depend on the econometric model selected.

The data set assembled and used in this paper distinguishes between long-term and short-term dollar debt. Up to our knowledge, the distinction between short term and long term debt in the context of balance-sheet effects has only been analyzed by Aguiar (2005). As was discussed previously, that paper focuses on the post-Tequila Mexican crises which might limit the usefulness of the results as policy guides for non-crises episodes. As we will explain later, the distinction among short and long term debt is important in practice. Finally we will also analyze the extent to which the balance-sheet effect is non-linear and will do so including interaction terms with the stock of dollar debt and real currency depreciation.[16]

[16] In language used in the estimation of production functions, we will include a full translog specification.

5 Empirical Evidence

5.1 What Determines Dollar Debt?

According to the discussion presented earlier, we analyze first the influence of foreign exposure and firms' financial characteristics on the amount of dollar debt owed by each firm. A distinct feature of the data is that the variability in the degree of debt dollarization comes mostly from the cross-section. In other words, there is not much change in the degree of dollarization of a given firm over time. Therefore we analyze the liability dollarization using a pooled regression in which the unit of observation is the average for each firm during the sample period. In panel econometrics jargon, this corresponds to the between transformation of the standard panel data model.

Given this transformation, we are able to calculate an additional measure of foreign exposure. This is the correlation of the firm's operational result (i.e. earnings before interest and taxes or EBIT) growth rate with the growth rate the real exchange rate. For each firm the correlation is calculated over the whole sample period. We expect that, according to the hedging hypothesis, the more correlated a firm's income is with the exchange rate, the bigger the importance of dollar-denominated debt in its financial structure. As Figure 3 shows, there appears to be indeed a positive association between both variables. Moreover, using this type of correlation gives us a firm-specific measure of external exposure as opposed to the industry level export and import penetration measures discussed earlier.

The positive correlation between both variables is confirmed also in the regressions presented in Tables 1 and 2. The only difference between these tables is the inclusion of industry-level dummies in the second one. It should be noted that column (5) in those Tables corresponds to total foreign currency debt: it includes foreign currencies different than the U.S. dollar.[17] As can be seen, the

[17] In general, these are relatively small amounts about which few details are provided in the data source. Indeed when firms have liabilities payable in other foreign currencies it is often the case that they are declared as "other currencies" and the amount is published only in pesos. This amount in pesos was added to the dollar-denominated

data indicate that dollar debt represents a higher fraction of total financing in bigger firms and those with a higher debt/equity ratio.

With respect to the foreign exposure measures, there are two main results both of which support the hedging hypothesis. In first place, the correlation of the firm's EBIT and the real exchange rate exerts a positive influence on the amount of dollar debt hold by the firm. Yet, as the comparison of Table 1 and Table 2 reveals, the statistical significance of this variable fades away when industry-level controls are included. This fact points to the existence of multicollinearity between the industry-level controls and correlation of EBIT and real exchange rate growth rates. From this perspective, these regressions shed some light on what industry-level dummies, commonly used in the previous work on this topic, really measure.[18]

In the second place, it is important to note that the export penetration measure calculated here has a positive effect on the liability dollarization of firms. In contrast, the import penetration measure doesn't have a statistically significant effect on debt dollarization. This result can be interpreted in terms of the pricing-to-market assumption that characterizes many of the new open economy models. If indeed exporters tend to set the price of their goods in terms of the foreign currency, then exchange rate movements are not going to affect import prices measured in domestic currency. Hence, the performance of domestic firms subject to import competition will be less dependent on the exchange rate.

The panel regression results are presented in Table3 and Table 4 that include the fixed effect and panel estimation respectively. As can be seen, only the scale of the firm, as measured by the logarithm of total assets, has a significant effect on the amount of dollar debt due by each firm. The lack of significance of the other regressors is explained mainly by their lack of significant variation across time. Yet, the point estimates confirm the results of the pooled regressions discussed above.

debt. Implicitly then we assumed all foreign currency debt was issued in dollars in the series used in column (5).

[18] In other words these results suggest that the correlation between the growth rate of firms' EBIT and the real exchange rate constitutes an adequate characterization of each industrial sector.

5.2 Is there a Balance-Sheet Effect?

As we noted in Section 2, a significant number of previous empirical papers on this topic has failed to find a significant balance-sheet effect as the one described by Krugman (1999). The leading explanation for this has been that those firms who issue dollar debt are precisely those who are benefited by devaluation. Given this we analyzed the relative performance of firms with and without dollar debt in periods of high exchange rate depreciation and in periods of relatively stable exchange rate. In particular we examined the distribution of operational income growth between both types of firms in those periods. This was done using the Kernel density procedure in STATA and the results appear in Figures 4 and 5. those figures suggest, it seems to be the case that precisely those firms that engage in dollar debt are those whose income is positively related to exchange rate movements. Thus, this fact appears to be one of the key explanations for the missing balance-sheet phenomenon. Previous research has indeed pointed to this argument as the central explanation for the absence of a negative balance-sheet effect (see for instance Bleakley and Cowan (2002)). For the case of Chile the importance of controlling for the correlation between firms' profitability and the real exchange rate to detect a balance-sheet effect has been pointed out previously by Cowan et al. (2006).

As we suggested earlier, the failure to detect a negative balance-sheet effect could potentially also be explained by the fact that the sample period used in some papers does not include episodes of significant exchange rate depreciation. To shed some light on this conjecture, we ran a cross section regression of investment for the year 2001 when both the real and nominal Chilean exchange rate exhibit significant depreciation (recall Figure1) using a similar specification to the one used by Bleakley and Cowan (2002). The results are presented in Table5 strongly suggest that the omission of the high depreciation period explains the absence of a negative balance-sheet effect.[19]

[19]The balance-sheet is defined as in equation (2): dollar debt stock at the end of period $t-1$ multiplied by the change in the real exchange rate between $t-1$ and t and normalized by the initial capital stock.

The coefficients estimated in Table 5 imply that dollar debt has a significant negative effect on investment during this year of high depreciation of the exchange rate. The fact that this result is robust to the inclusion of 3-digit industry level controls (columns (3) and (4)) indicates that dollar debt is not capturing merely a negative shock to the tradable sector of the economy.

The merits of the data set assembled for this paper are confirmed by the results in Table5 that show that the balance-sheet effect associated with long-term debt is different from the one of short-term debt. In particular, the negative balance-sheet effect appears to be entirely linked to long-term debt as suggested by the negative and significant coefficient estimated for this variable. On the contrary, the coefficient on short-term dollar debt is not statistically significant and the point estimate is even positive in some specifications. This finding that the negative balance-sheet effect is tied to long term debt instead of short term debt is exactly the opposite reported by Aguiar (2005).

The panel regression results are presented in Table 6. As explained earlier, these regressions are estimated using an instrumental variable approach. The specification in column (1) is the most similar to the ones used in previous studies in the sense that the balance-sheet effect is measured with respect to total debt. As can be seen both the point estimate and standard error indicate that there is no balance-sheet effect. If one interprets the results following the explanation of Bleakley and Cowan (2002) for the absence of a balance-sheet effect in many empirical papers, this implies that the negative worth effect and the productivity effect cancel each other. Therefore, firms appear to hedge their risks efficiently. Moreover, according to the evidence presented in column (2), the balance-sheet effect does not appear to be non-linear: the square of the total balance-sheet variable is not statistically significant and the point estimate is also close to zero.

As discussed earlier, the unique characteristics of the data set used in this paper allows us to study if short-term debt and long-term debt have a different impact on the balance-sheet effect. As

columns (3) and (4) reveal, the two types of debt appear to have a different effect on the level of investment. Specifically, and in line with the findings for year 2001, the balance-sheet effect appears to be linked to long-term debt as this term is negative and statistically significant.

Finally, column (5) indicates that the balance-sheet effect is non-linear and associated with long-term debt. In that specification quadratic and terms of the balance-sheet term and interactions of the square of debt and depreciation are included[20]. It is especially important to note the strong negative coefficient associated with the square of the depreciation rate when interacted with long-term dollar debt. This suggests that the balance-sheet effect deters investment more significantly in periods when exchange rate depreciation is high.

The results obtained in our paper can be explained from an economic perspective along the following lines. Regarding short-term debt, a significant part of it corresponds to debt directly related to foreign trade like credit letters.[21] Therefore, this type of dollar debt is "hedged" in the sense that it is directly tied to an income flow that is also positively correlated with the exchange rate. In other words, ceteris paribus, a depreciation of the currency is expected to increase both the income flow and the debt payment with no effect on the creditworthiness of the firm. Moreover, one could also interpret that short-term dollar debt is a proxy variable for the degree of positive correlation between the firm's profitability and real currency depreciation.

On the other hand, a real depreciation of the currency will increase the value of payments associated with long-term debt both in the current period and in the future. In this sense the creditworthiness of the firm decreases permanently. Therefore, one would expect that the negative balance-sheet effect is linked to long term dollar debt precisely as the results in Tables5 and 6 show.

Related to this, it should be noted that the depreciation of the currency observed in the year

[20]This is similar to a trans-log specification as the ones used in to study production functions

[21]The claim that a big fraction of short-term debt is related to foreign trade comes from direct observation of the data while the database was assembled.

2001 can be characterized as a persistent phenomenon: it took approximately two years for the nominal and real exchange rates to return to values similar to ones observed before 2001. The fact that negative balance-sheet effects are detected when more clearly only when the change in the exchange rate is of a more sustained nature could also explain why many studies report the absence of a balance-sheet effect.

Is a Balance-Sheet Effect Likely? Additional Evidence from the Stock and Foreign Exchange Markets.

The regression evidence presented in the preceding subsection strongly suggests that there exists a negative balance-sheet effect associated to long-term debt dollar debt in periods of strong depreciation of the exchange rate. This finding stands out against what a significant part of previous work has found according to the literature reviewed earlier. In order to strengthen our finding of a negative balance-sheet effect we will present two additional pieces of evidence that help to explain why a negative balance-sheet effect is a reasonable result.

The first of these pieces is related to the strong negative correlation between Chile's real exchange rate and the price of commodities measured in U.S. dollars observed in international markets. World commodity prices are used here as a proxy of the price of the goods sold by firms in Chile's tradable sector.[22] The negative correlation between both variables can be seen in Figure6 that plots the annual growth of the World Bank commodity price index (deflated by the U.S. CPI) against the annual growth of the CPI-based Chilean real exchange rate. This figure suggests that periods of exchange rate depreciation tend to coincide with decreases in the real price of the goods

[22]The series corresponds to the World Bank Commodity Price Index for lower middle-income countries (LMIC). The data was taken from the IFS. The results reported here are robust to the use of other commodity prices index like the ones for Non-Metals, Non-Fuel and Primary Commodities.

exported by Chilean firms. This fact implies that the real income measured in domestic currency does not increase when the real exchange rate depreciates precisely because the price in dollars of the good produced by the firm decreases. Formally, the real value of an export firm income measured in pesos is given by:

$$\frac{P_X^{\$} \cdot E}{CPI^{CH}} \equiv \frac{P_X^{\$}}{CPI^{US}} \frac{E \cdot CPI^{US}}{CPI^{CH}} \tag{4}$$

Where $P_X^{\$}$ is the price in dollars of the good sold by the firm, E is the peso/dollar exchange rate, CPI^{CH} is the domestic price index and CPI^{US} is the U.S. price index. In terms of equation (4), Figure 6 plots the growth rates of each term in the right hand side that in turn correspond to the real-dollar price of the good and the CPI based real exchange rate.

This observation casts doubts on the leading explanation given in the literature to explain the absence of balance-sheet effects. That explanation argued that real depreciation had a counterbalancing effect on the firm's financial health through the higher value of the income flow. The evidence we've just presented points out that the counterbalancing effect is not as strong in the Chilean case because the price in dollar of the tradable goods falls as well. It is important to note that the negative correlation of the real exchange rate and the price of exports has been also documented by Chen and Rogoff (2003) and Cashin, Céspedes and Sahay (2004) for other small open economies.

The second piece of evidence that suggests that a negative balance-sheet effect is a plausible result is related to the behavior of the real exchange rate and the stock market valuation of firms in the tradable sector. The absence of a balance-sheet effect will imply that the market value of firms producing tradable goods should increase when the real exchange rate depreciates. This will be the result of a competitiveness effect that benefits firms in the tradable sector. The data gives scant support to this hypothesis.

Figure 7 plots the annual percentage change in the real value of firms that belong to the industrial sector against the annual percentage change in the real exchange rate. As it is evident, the relation between both variables appears to be, if anything, negative. In other words a real currency depreciation does not increase the value of capital of firms in the tradable sector and this might be explained by the presence of a negative balance-sheet effect. It is important to add that Von Furstenberg and Taborda (2003) also find a negative correlation between stock prices of Mexican firms and Mexico's exchange rate.[23]

We can conclude then that both pieces of evidence, although they do not prove that a balance-sheet effect exists, are consistent with its presence and therefore provide some additional support for the regression results presented above.

6 Conclusion

This paper has tried to increase our understanding of a new channel through which exchange rate fluctuations can affect the economy of emerging markets: the financial health of firms holding dollar debt. The paper also studies the factors that explain why firms contract dollar debt. Our work complements previous studies in this area by providing evidence on the consequences of exchange rate fluctuations and currency mismatches in non-crises situations distinguishing between the effects of long and short term debt.

The econometric evidence presented indicates that dollar debt represents a higher fraction

[23]Grossman and Levinsohn (1989) studied the relationship between the price of imports and the stock returns of firms producing import-competing goods in the U.S. and report a positive relationship between both variables. The evidence we present here is not entirely contradictory with their results. Our results indicate that commodity prices in US dollars (i.e. price of Chilean exports) are negatively correlated with Chile's real exchange rate. This implies that, for a firm that exports commodities, its income measured in pesos stays (roughly) constant when commodity prices decrease (and conversely the currency suffers a real depreciation). Yet, the presence of dollar-denominated debt in its financing structure produces a negative balance-sheet effect and hence decreases the firm's profits and stock return. Grossman and Levinsohn (1989) do not consider this effect because (i) the import prices are quoted directly in dollars (i.e. the domestic currency of U.S. firms) (ii) their sample lacks information on the currency composition of the firms' debt.

of total liabilities for firms with income positively tied to the real exchange rate. The data also indicate that foreign-currency financing is more common in larger firms and those that already have access to external financing. All these results indicate that the observed pattern of foreign-currency debt is consistent with the desire of firms to hedge or match the risk of their income flow with their financing sources.

Notwithstanding, foreign currency debt and real exchange rate fluctuations combine to produce a negative balance-sheet effect. This effect is stronger when the real exchange rate depreciation is higher and is tied to long-term debt. Both elements indicate then that the channel through which the effect occurs is through a worsening of the firm's creditworthiness. With respect to policy implications, this paper suggests that it is important to monitor the degree of foreign currency indebtedness in the economy since this could have an important impact on the behavior of the economy in the aftermath of currency depreciations. This results complements the findings of Aguiar (2005) who, in contrast to our results, finds that the negative balance-sheet effect is tied to short term debt. As explained earlier, Aguiar (2005) studies the aftermath of the Tequila Crisis so his finding regarding the importance of short-term debt appears to be sensitive to the specific episode he studies. In this sense, the evidence from Chile presented in this paper might serve as a better policy guide for more tranquil times since the sample does not include a major economic disruption as the Tequila crisis. The experience of the Chilean economy might also be valuable since it provides evidence that balance-sheet effects might exist even in an economy with a relatively advanced domestic capital market and where the overall degree of dollarization is moderate.

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Table 1: Determinants of Dollar Debt: Pooled Regression

	(1) Dollarized Liabilities (%)	(2) Dollarized Liabilities (%) Short Term	(3) Dollarized Liabilities (%) Long Term	(4) Foreign Currency Debt	(5) Foreign Currency Liabilities (%)
Debt/Equity	0.021	0.002	0.019	-0.006	0.021
	(0.009)*	(0.006)	(0.007)**	(0.023)	(0.009)*
$\rho(\gamma^{EBIT}, \gamma^{RER})$	0.066	0.043	0.023	0.209	0.065
	(0.028)*	(0.018)*	(0.021)	(0.071)**	(0.029)*
Import Penetration	0.010	0.017	-0.007	0.038	0.010
	(0.019)	(0.012)	(0.014)	(0.048)	(0.019)
Export Penetration	0.033	0.037	-0.004	0.130	0.038
	(0.045)	(0.029)	(0.033)	(0.115)	(0.046)
Total Assets (log)	0.013	-0.001	0.014	0.036	0.013
	(0.005)**	(0.003)	(0.004)**	(0.012)**	(0.005)*
Constant	-0.172	0.047	-0.219	-0.432	-0.168
	(0.085)*	(0.054)	(0.062)**	(0.215)*	(0.086)
Observations	114	114	114	114	114
R-squared	0.15	0.11	0.19	0.17	0.15

Standard errors in parentheses.
significant at 5%; ** significant at 1%
$\rho(\gamma^{EBIT}, \gamma^{RER})$ corresponds to the correlation between the growth rates of EBIT and the real exchange rate.
In (1), (2) and (3) the dependent variables is measured as fraction of total assets.
In (4) the dependent variables is measured as fraction of external financing (debt plus equity).
Column (5) includes other foreign currencies different than the U.S. dollar. Also measured as fraction of total assets.

Table 2: Determinants of Dollar Debt: Pooled Regression
Includes industry dummies

	(1) Dollarized Liabilities (%)	(2) Dollarized Liabilities (%) Short Term	(3) Dollarized Liabilities (%) Long Term	(4) Foreign Currency Debt	(5) Foreign Currency Liabilities (%)
Debt/Equity	0.042	0.006	0.036	0.058	0.040
	(0.013)**	(0.007)	(0.010)**	(0.030)	(0.014)**
$\rho(\gamma^{EBIT}, \gamma^{RER})$	0.052	0.027	0.026	0.141	0.048
	(0.033)	(0.018)	(0.026)	(0.074)	(0.034)
Import Penetration	-0.134	-0.058	-0.076	-0.296	-0.133
	(0.070)	(0.037)	(0.055)	(0.157)	(0.072)
Export Penetration	0.420	0.250	0.170	1.028	0.414
	(0.153)**	(0.081)**	(0.120)	(0.341)**	(0.156)**
Total Assets (log)	0.009	-0.005	0.014	0.023	0.010
	(0.007)	(0.004)	(0.005)*	(0.016)	(0.007)
Constant	-0.154	0.063	-0.217	-0.372	-0.169
	(0.132)	(0.070)	(0.103)*	(0.294)	(0.135)
Observations	114	114	114	114	114
R^2	0.43	0.59	0.37	0.57	0.42

Standard errors in parentheses.
significant at 5%; ** significant at 1%
$\rho(\gamma^{EBIT}, \gamma^{RER})$ corresponds to the correlation between the growth rates of EBIT and the real exchange rate.
In (1), (2) and (3) the dependent variables is measured as fraction of total assets.
In (4) the dependent variables is measured as fraction of external financing (debt plus equity).
Column (5) includes other foreign currencies different than the U.S. dollar. Also measured as fraction of total assets.
Includes industry dummies

Table 3: Determinants of Dollar Debt: Panel Regression

	(1) Dollarized Liabilities (%)	(2) Dollarized Liabilities Short Term (%)	(3) Dollarized Liabilities Long Term (%)	(4) Foreign Currency Debt
Debt/Equity	0.0000	0.0000	0.0000	0.0000
	(0.0000)	(0.0000)	(0.0000)	(0.0000)
Import Penetration	0.002	0.011	-0.009	0.030
	(0.013)	(0.009)	(0.011)	(0.035)
Export Penetration	0.002	0.003	-0.001	0.017
	(0.011)	(0.007)	(0.009)	(0.030)
Total assets (log)	0.026	0.006	0.020	0.033
	(0.004)**	(0.003)	(0.004)**	(0.012)**
Constant	-0.387	-0.068	-0.319	-0.438
	(0.073)**	(0.050)	(0.060)**	(0.201)*
Observations	1272	1272	1272	1272
R^2	0.08	0.01	0.10	0.13

Standard errors in parentheses.
significant at 5%; ** significant at 1%
In (1), (2) and (3) the dependent variables is measured as fraction of total assets.
Column (5) includes other foreign currencies different than the U.S. dollar. Also measured as fraction of total assets.

Table 4: Determinants of Dollar Debt: Panel Regression

	(1) Dollarized Liabilities (%)	(2) Dollarized Liabilities Short Term (%)	(3) Dollarized Liabilities Long Term (%)	(4) Foreign Currency Debt
Debt/Equity	0.0000	0.0000	0.0000	0.0000
	(0.0000)	(0.0000)	(0.0000)	(0.0000)
Import Penetration	-0.000	0.009	-0.010	0.027
	(0.013)	(0.009)	(0.010)	(0.035)
Export Penetration	0.003	0.005	-0.001	0.021
	(0.011)	(0.007)	(0.009)	(0.029)
Total assets (log)	0.020	0.000	0.018	0.028
	(0.003)**	(0.002)	(0.003)**	(0.008)**
Constant	0.000	0.100	-0.300	0.000
	(0.000)	(0.059)	(0.089)**	(0.000)
Observations	1272	1272	1272	1272

Standard errors in parentheses.
significant at 5%; ** significant at 1% the growth rates of EBIT and the real exchange rate.
In (1), (2) and (3) the dependent variables is measured as fraction of total assets.
In (4) the dependent variables is measured as fraction of external financing (debt plus equity).
Includes industry and year dummies plus firm-level random effects.

Table 5: Balance Sheet Effect in a High Depreciation Year

	(1)	(2)	(3)	(4)
Traditional Investment Determinants				
Investment Rate $_{(t-1)}$	0.001	0.0004	0.002	0.002
	(0.003)	(0.0027)	(0.002)	(0.002)
Profits to capital ratio	0.0003	0.0000	-0.002	-0.001
	(0.0075)	(0.0075)	(0.006)	(0.006)
Profits to capital ratio $_{(t-1)}$	0.0001	0.001	0.004	0.003
	(0.016)	(0.016)	(0.012)	(0.012)
Profits to capital ratio $_{(t-2)}$	-0.011	-0.011	-0.014	-0.015
	(0.010)	(0.010)	(0.008)*	(0.008)*
Difference log(sales)	0.166	0.111	-0.056	0.012
	(0.263)	(0.275)	(0.227)	(0.230)
Difference log(sales) $_{(t-1)}$	-0.018	-0.054	0.113	0.169
	(0.206)	(0.213)	(0.215)	(0.216)
Difference log(sales) $_{(t-2)}$	0.036	0.010	0.209	0.295
	(0.952)	(0.955)	(0.802)	(0.798)
Balance Sheet Effects				
Total	-0.180		-0.167	
	(0.028)***		(0.020)***	
Short Term		-0.485		0.369
		(0.437)		(0.350)
Long Term		-0.155		-0.210
		(0.046)***		(0.035)***
Observations	135	135	135	135
R^2	0.27	0.27	0.73	0.74

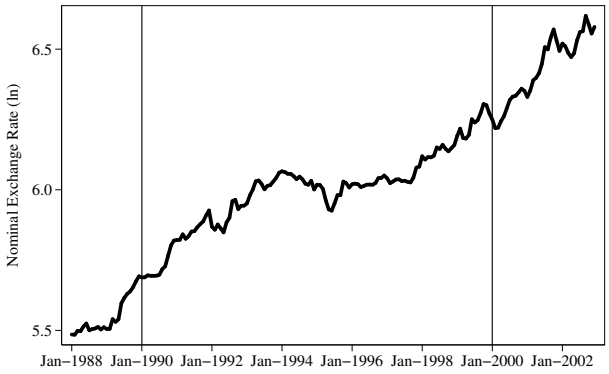
Standard errors in parentheses.
significant at 10%; ** significant at 5%; *** significant at 1%
Columns (3) and (4) include industry level controls.

Table 6: Investment and Balance Sheet Effects

	(1)	(2)	(3)	(4)	(5)
Traditional Investment Determinants					
Investment Rate $_{(t-1)}$	0.0003	0.0003	0.0002	0.0002	0.0003
	(0.0011)	(0.0011)	(0.0011)	(0.0011)	(0.0011)
Δ log(sales)	0.073	0.073	0.075	0.076	0.072
	(0.042)*	(0.042)*	(0.042)*	(0.042)*	(0.043)*
Δ log(sales) $_{(t-1)}$	0.068	0.068	0.07	0.073	0.063
	(0.056)	(0.056)	(0.056)	(0.056)	(0.057)
Δ log(sales) $_{(t-2)}$	0.121	0.121	0.126	0.13	0.122
	(0.069)*	(0.069)*	(0.069)*	(0.070)*	(0.070)*
Profits to capital ratio	-0.015	-0.015	-0.017	-0.018	-0.018
	(0.002)***	(0.002)***	(0.002)***	(0.003)***	(0.003)***
Profits to capital ratio $_{(t-1)}$	-0.0002	-0.0002	0.001	0.001	0.001
	(0.001)	(0.001)	(0.001)	(0.001)	(0.002)
Profits to capital ratio $_{(t-2)}$	0.00008	0.00009	0.001	0.002	0.001
	(0.00126)	(0.00127)	(0.00100)	(0.00100)	(0.00200)
Balance Sheet Effects					
Total	0.0005	0.0003			
	(0.0004)	(0.0019)			
Total^2		1.29E-07			
		(1.19E-06)			
Short Term			0.001	0.002	0.006
			(0.000)*	(0.002)	(0.012)
Long Term			-0.021	-0.013	-0.060
			(0.013)*	(0.020)	(0.030)**
(Short Term)^2				0.000	0.00002
				(0.000)	(0.00004)
(Long Term)^2				-0.0004	0.001
				(0.0006)	(0.001)
$(DEP)^2$ * Short Term $D^\$$					-0.0008
					(0.125)
(Short Term $D^\$)^2$ * DEP					0.000
					(0.000)
$(DEP)^2$ * Long Term $D^\$$					-0.539
					(0.277)*
(Long Term $D^\$)^2$ * DEP					0.0002
					(0.0001)**
Observations	922	922	922	922	922
Number of Firms	165	165	165	165	165

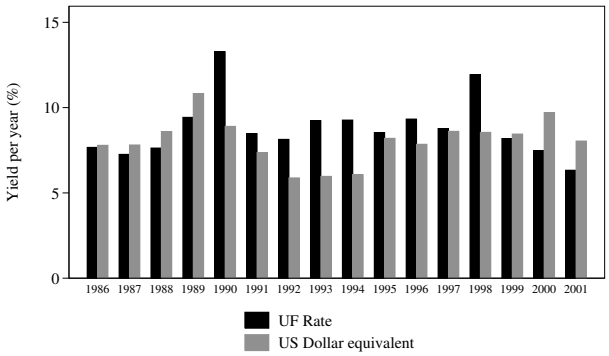
Standard errors in parentheses.
significant at 10%; ** significant at 5%; *** significant at 1%
DEP corresponds to the depreciation of the real exchange rate.
$D^\$$ corresponds to the amount of dollar denominated debt.
Δ is the first difference operator.
All regressions include a constant term and year fixed effects.

Figure 1: Chile's Nominal Exchange Rate (log)
End of month data



Source: Global Financial Database

Figure 2: UF and Dollar-equivalent Interest Rates



Source: Global Financial Database
and Central Bank of Chile

Figure 3: Debt Dollarization and Foreign Exposure

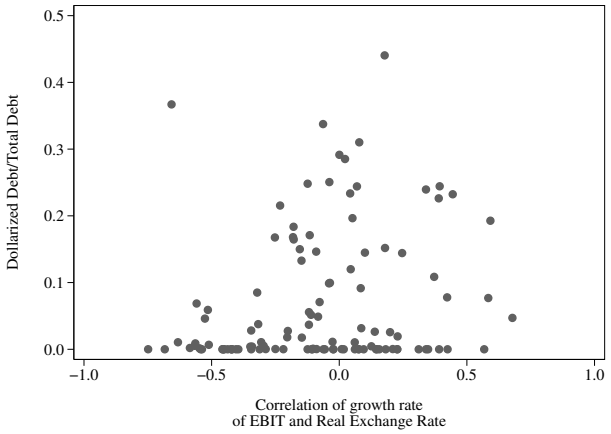


Figure 4: Distribution of Income Growth in 1995
(Low depreciation year)

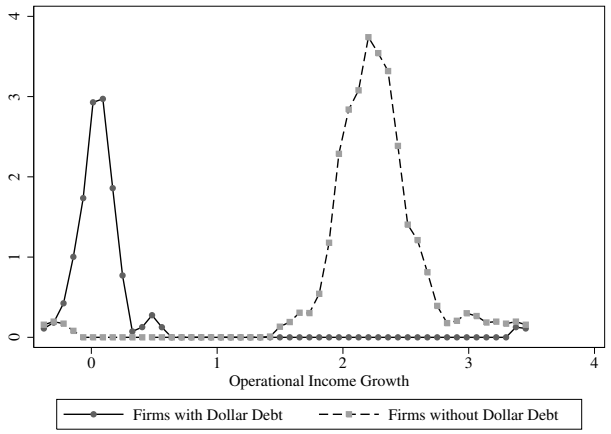


Figure 5: Distribution of Income Growth in 1999
(High depreciation year)

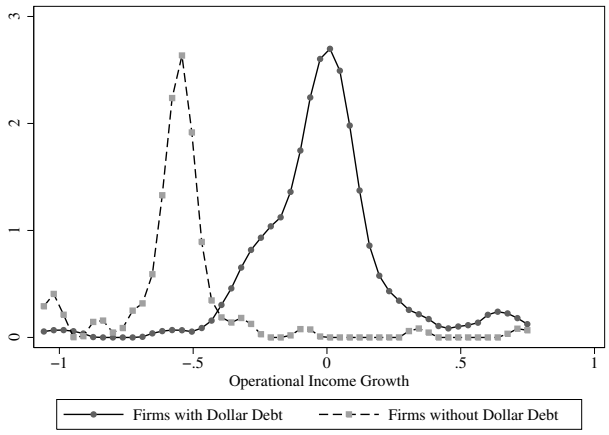


Figure 6: World Commodity Prices and Chile's Real Exchange Rate

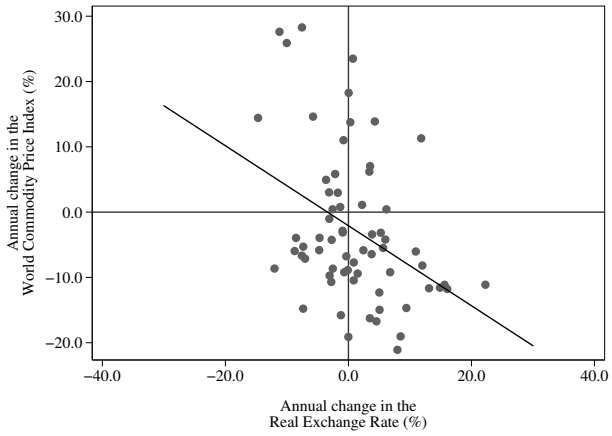


Figure 7: Industrial Sector's Market Value and Chile's Real Exchange Rate